MEMORANDUM

To: Ms. Debra Rossi, RPM (USEPA Region III)

From: Theresa Miller, PG, LSP (Golder) and Michele Ruth, PE (RAI)

Date: May 10, 2019

RE: Response to Comments on Revision 1 of Work Plan for Additional Investigation and Revision 1 of Sampling and Analysis Plan, Army Creek Landfill, New Castle County, Delaware

On behalf of New Castle County (NCC) and the Army Creek Private Settlors (ACPS), Ruth Associates Inc. (RAI) and Golder Associates Inc. (Golder) prepared this combined response-to-comments document for the Army Creek Landfill (ACL) Superfund Site (Site) located in New Castle County, Delaware. This document addresses the comments from the United States Environmental Protection Agency (USEPA) on the following documents:

- Work Plan for Additional Investigation (Work Plan) – Revision 1 by RAI dated March 27, 2019 (RAI, 2019)
- Sampling and Analysis Plan - Revision 1 (SAP; included as Attachment 4 of the Work Plan) by Golder dated March 2019 (Golder, 2019)

Comments on the Work Plan and SAP were provided by the USEPA via email dated April 30, 2019 (USEPA, 2019). The following sections set forth the written comments from the USEPA and the responses to those comments from the ACPS and NCC.

USEPA Comments with ACPS and NCC Responses

Revised Work Plan for Additional Investigation

USEPA Comment 1. Page 10, Groundwater Monitoring:
Collection of samples from two different depths within long well screens is proposed. It is not clear what method would be used to sample different locations within the same screen interval. It should be noted that a pumped sample, regardless of where the pump is placed in the screen, will provide a flow weighted sample from the screened interval. Volumetric purging and sampling of the entire well screen should be conducted for the work comparing volumetric purging and sampling with low flow purging and sampling at an individual well. It should also be a well-by-well analysis; results from one well are not transferable to another well location. The Work Plan should specify how the samples from the two different depths will be collected (e.g., low flow purging and sampling) and how the data will be compared both with historical data (Is the proposed sampling method/depth consistent with historical sampling protocol?) and volumetric purging and sampling data.

ACPS and NCC Response to USEPA Comment 1:
Based on our review of the comment, RAI, Golder and the USEPA have a similar understanding of the procedures and the data analysis related to the comparison of volumetric purging and sampling with low flow purging and sampling at individual wells; however, the general text included in the Work Plan doesn't provide enough detail to demonstrate such. In response to the first part of USEPA Comment 1, the proposed depths for low-flow purging and sampling referenced in paragraph 3 on Work Plan page 10 are listed on Table 4 of the SAP. More specifically, SAP Table 4 includes columns "Purging and Sampling Method", "Proposed Sampling

Depth (ft-btoc)", "Secondary Method for Comparison" and Previous Sampling Depth (ft-bgs)" which identify the wells and their respective purging and sampling methodologies and sampling depths. The following revised text for paragraph 4 on Work Plan page 10 clarification: "SAP Section 4.3.3.3 provides additional information on the procedures, and Table 4 indicates the subset of wells and the proposed sampling depths for which the low-flow purging and sampling will be performed. For the volumetric purging and sampling, the pump will be placed at the mid-point in the well screen (previous sampling depth)."

In response to the second part of this comment, the following revised text provides additional explanation: "The sample analytical results from each well for the different methodologies will be tabulated along with their sampling depths to facilitate direct, well-by-well comparison of the information. The data for each well will also be compared on a well-by-well basis using a relative percent difference (RPD) calculation. Historic analytical data, purging and sampling method and depths from the last three years (2016 to 2018) will also be provided for comparison. The results will be included in the second 2019 semi-annual monitoring event report for the Site. This one-time event activity is being conducted to determine whether low-flow purging and sampling is appropriate for individual long-screen wells at the Site."

USEPA Comment 2. Table 1:
April and October groundwater samples collected from wells MW-28, MW-29, MW-31, BW-1, BW-2, BW-3 and MW-40 should also be analyzed for cations and anions.

ACPS and NCC Response to USEPA Comment 2:
In response to this comment, we have revised Table 1 of the Work Plan (see attached) and Table 3 of the SAP (see attached).

Sampling and Analysis Plan

USEPA Comment 3. Section 4.2.2, PFAS in Groundwater:
It is reported here that wells MW-28, MW-29, MW-31, BW-3, and MW-58 will be purged and sampled from two locations within the screened interval to assess potential differences in concentrations across the two units (see discussion in Section 4.3.3.3). A pumped sample, regardless of where the pump is placed in the screen, will provide a flow weighted sample. The proposed method is not appropriate as a surrogate for a volumetric purging and sampling method. See comment above.

ACPS and NCC Response to USEPA Comment 3:
Samples from these wells will be collected using volumetric purging and sampling methods, and samples will be collected from two different intervals using low-flow purging and sampling methods for comparative analysis as described in the response above to USEPA Comment 1 about "Page 10, Groundwater Monitoring".

USEPA Comment 4. Section 4.3.2.1, Monitoring Well Installation:
It is reported here that "the 5- to 7-foot screened interval will be selected for each well will be determined based on visual, olfactory and/or PID evidence of impacts. In the absence of impact evidence, the well will be screened across interval with the coarsest material in either the UPA upper or lower sand. More specifically, the placement of the well screens will be determined in the field, based on: 1) observed volatile organic impact based on organic vapor (i.e., PID) readings; and/or 2) visual evidence of impacts. If there is no evidence of either, then the screen interval will be set across the portion of the UPA (either upper sand or lower sand) with the

coarsest materials. Prior to well construction within the advanced borehole, the USEPA will be provided with a draft annotated boring log indicating the proposed well screen interval for their review and approval of the proposed screened interval. Due to concerns regarding limiting resident's access to their property during boring advancement and well installation, a quick response/approval (within two business hours) from the USEPA will be necessary".

It is recommended that a cross section with lithology, bedding correlations and proposed/constructed screen intervals be submitted to facilitate EPA review and approval of proposed screened intervals. Information provided in this format during drilling at DS&G was extremely useful. EPA will provide a response/approval as soon as practicable. Advance notification regarding the timing of upcoming well construction proposals would help EPA schedule time for proposal reviews.

ACPS and NCC Response to USEPA Comment 4:
RAI, on behalf of NCC, with assistance from Golder, on behalf of ACPS, will prepare and submit cross sections with lithology, bedding correlations and proposed/constructed screen intervals (similar to those provided for DS&G) for the USEPA's use during the review and approval process for the proposed well screen intervals at the four investigation locations (WL-1U/L, WL-2U/L, P-4L, and MW-22NU). RAI will provide schedule updates to EPA during the course of drilling and will provide anticipated timing for EPA's receipt of well screen recommendations.

REFERENCES

Golder, 2019. Attachment 4 - Sampling and Analysis Plan – Revision 1, Army Creek Landfill Superfund Site, New Castle County, Delaware. March 2019.

RAI, 2019. Army Creek Landfill - New Castle County, Delaware, Revised Work Plan for Additional Investigation. March 27, 2019.

USEPA, 2019. Letter via email - USEPA Comments on Revised Work Plan for Additional Investigation and Sampling and Analysis Plan; Army Creek Landfill, New Castle County, Delaware. April 30, 2019.

ATTACHMENTS

Revised Table 1 (Work Plan) – Proposed Monitoring Program
Revised Table 3 (SAP) – Proposed Monitoring Program

REVISED TABLE 1
PROPOSED MONITORING PROGRAM
ARMY CREEK LANDFILL, NEW CASTLE, DELAWARE

Monitoring Location	Well Type	PFAS	Western Lobe	Cations and Anions	Supply Wells	Water Levels
MW-28	Former Recovery	X		X		X
MW-29	Former Recovery	X		X		X
MW-31	Former Recovery	X		X		X
RW-10	Former Recovery	X	X	X		X
BW-1	Existing Monitoring	X		X		X
BW-2	Existing Monitoring	X		X		X
BW-3	Existing Monitoring	X		X		X
MW-40	Existing Monitoring	X		X		X
MW-38N	Existing Monitoring					X
P-4	Existing Monitoring	X	X	X		X
P-4L	Proposed Monitoring	X	X	X		X
WL-1U	Proposed Monitoring	X	X	X		X
WL-1L	Proposed Monitoring	X	X	X		X
WL-2U	Proposed Monitoring	X	X	X		X
WL-2L	Proposed Monitoring	X	X	X		X
P-5U	Existing Monitoring					X
P-5L	Existing Monitoring					X
P-6	Existing Monitoring					X
MW-22N	Existing Monitoring	X	X	X		X
MW-22NU	Proposed Monitoring	X	X	X		X
MW-26N	Existing Monitoring					X
MW-49N	Existing Monitoring					X
MW-54	Existing Background	X				X
MW-56	Existing Background	X				X
MW-58	Existing Background	X				X
MW-18	Existing Monitoring					X
DGC-10S	Existing Monitoring					X
DGC-10D	Existing Monitoring					X
DGC-11S	Existing Monitoring					X
DGC-11D	Existing Monitoring					X
GV-1	Gas Vent	X				X
GV-7	Gas Vent	X				X
GV-9	Gas Vent	X				X
GV-13	Gas Vent	X				X
GV-14	Gas Vent	X				X
GV-17	Gas Vent	X				X
GV-29	Gas Vent	X				X
GV-46	Gas Vent	X				X
GV-48	Gas Vent	X				X
GV-51	Gas Vent	X				X
AWC-2	Supply Well			X	X	
AWC-G3R	Supply Well			X	X	
AWC-6R	Supply Well			X	X	
AWC-7	Supply Well			X	X	

5/3/2019

Notes:

X - Groundwater samples will be analyzed for PFAS suite, consistent with the PFAS suite for DS&G, plus field parameters
Samples from gas vents will be analyzed for PFAS suite only

X - Quarterly analytical parameters will include VOCs, total and dissolved iron, total and dissolved manganese, total and dissolved cobalt, and field parameters.

X - The semi-annual events (April and October) will include and cations and anions as follows:
calcium, magnesium, potassium, sodium, ammonia, nitrate, nitrite, sulfate, sulfide, chloride, and bicarbonate.

X - Supply wells will be sampled by AWC monthly for iron and manganese analyses, and quarterly for cobalt.
Cations and anions to be sampled semi-annually. Only wells that are operating will be sampled during each event.

X - A complete round of water levels will be measured synoptically at all wells, within 48 hours of the completion of the sampling event.

(1) - PFAS monitoring event will be conducted synoptically during the first DS&G event performed after the new wells are installed.

(2) - Western Lobe Study will be conducted quarterly for four quarters, two of which will be done at same time as annual/semi-annual events.

(3) - Field Indicator Parameters include temperature, specific conductance, pH, oxidation-reduction potential, dissolved oxygen and turbidity.

REVISED TABLE 3
PROPOSED MONITORING PROGRAM
ADDITIONAL INVESTIGATION ACTIVITIES
ARMY CREEK LANDFILL SUPERFUND SITE
NEW CASTLE COUNTY, DELAWARE

Monitoring Location	Well Type	PFAS	Western Lobe	Cations and Anions	Supply Wells	Water Levels
MW-28	Former Recovery	X		X		X
MW-29	Former Recovery	X		X		X
MW-31	Former Recovery	X		X		X
RW-10	Former Recovery	X	X	X		X
BW-1	Existing Monitoring	X		X		X
BW-2	Existing Monitoring	X		X		X
BW-3	Existing Monitoring	X		X		X
MW-40	Existing Monitoring	X		X		X
MW-38N	Existing Monitoring					X
P-4	Existing Monitoring	X	X	X		X
P-4L	Proposed Monitoring	X	X	X		X
WL-1U	Proposed Monitoring	X	X	X		X
WL-1L	Proposed Monitoring	X	X	X		X
WL-2U	Proposed Monitoring	X	X	X		X
WL-2L	Proposed Monitoring	X	X	X		X
P-5U	Existing Monitoring					X
P-5L	Existing Monitoring					X
P-6	Existing Monitoring					X
MW-22N	Existing Monitoring	X	X	X		X
MW-22NU	Proposed Monitoring	X	X	X		X
MW-26N	Existing Monitoring					X
MW-49N	Existing Monitoring					X
MW-54	Existing Background	X				X
MW-56	Existing Background	X				X
MW-58	Existing Background	X				X
MW-18	Existing Monitoring					X
DGC-10S	Existing Monitoring					X
DGC-10D	Existing Monitoring					X
DGC-11S	Existing Monitoring					X
DGC-11D	Existing Monitoring					X
GV-1	Gas Vent	X				X
GV-7	Gas Vent	X				X
GV-9	Gas Vent	X				X
GV-13	Gas Vent	X				X
GV-14	Gas Vent	X				X
GV-17	Gas Vent	X				X
GV-29	Gas Vent	X				X
GV-46	Gas Vent	X				X
GV-48	Gas Vent	X				X
GV-51	Gas Vent	X				X
AWC-2	Supply Well			X	X	
AWC-G3R	Supply Well			X	X	
AWC-6R	Supply Well			X	X	
AWC-7	Supply Well			X	X	

5/3/2019

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(1) - PFAS monitoring event will be conducted synoptically during the first DS&G event performed after the new wells are installed.

(2) - Western Lobe Study will be conducted quarterly for four quarters, two of which will be done at same time as annual/semi-annual events.

(3) - Field Indicator Parameters include temperature, specific conductance, pH, oxidation-reduction potential, dissolved oxygen and turbidity.

(4) - See Attachment F for acronyms and abbreviations